FLOCK SIZE IN A SPRING CONCENTRATION OF WHISTLING SWANS[1]

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THE role of the family in the formation of goose flocks and the importance of flock-size counts as a means of estimating productivity and mortality in geese were described by Elder and Elder (1949). Their material referred mainly to frequency distributions of fall flocks and they emphasized that it would be very interesting to see a frequency distribution curve for migrating spring flocks. The present paper describes an attempt to study flock organization from repeated counts of a spring aggregation of Whistling Swans (*Olor columbianus*) in east-central Wisconsin.

The upland prairies of east-central Wisconsin are a traditional gathering area of Whistling Swans during spring migration. In early April 1962, a gathering of approximately 1,000 swans settled down on a 7-acre vernal pond about 2 miles southwest of the Ripon city limits. Canada Geese (*Branta canadensis*) were also present in this gathering and the resultant clamor could be heard in the city at all hours of the day and night. The center of this gathering ground was about 300 yards from the nearest road, but the swans frequently wandered to within 100 yards of the road as they foraged in the corn stubble surrounding the roost pond.

The authors began a series of systematic observations of the gathering on 4 April 1962 when 1,022 swans were counted in company with approximately 500 geese. The concentration continued at this level for the next 3 days. An abrupt drop in numbers occurred on 8 April when only 48 swans were present at dawn. By 10 April only 6 birds remained; there were no Canada Geese present. Over the first 4 days of observation, morning counts averaged 749 swans; midday and evening counts averaged 466 and 771 swans, respectively.

Pronounced diurnal foraging flights were not characteristic of these swans. Much, if not most, of the foraging was done on the pond itself or on surrounding fallow fields. The departure of this swan concentration was more likely related to decreased food (waste grain) than to changes in water level. It is probably significant that on 10 April a new gathering of 600 swans appeared on a flooded cornfield 6 miles southwest of the Ripon concentration area.

Departures and returns of small groups of swans occurred throughout the daylight hours at the Ripon gathering site. After a preliminary exchange of field notes and comments, the authors made independent daily counts of all departures and arrivals of swan groups during morning, noon, and late after-

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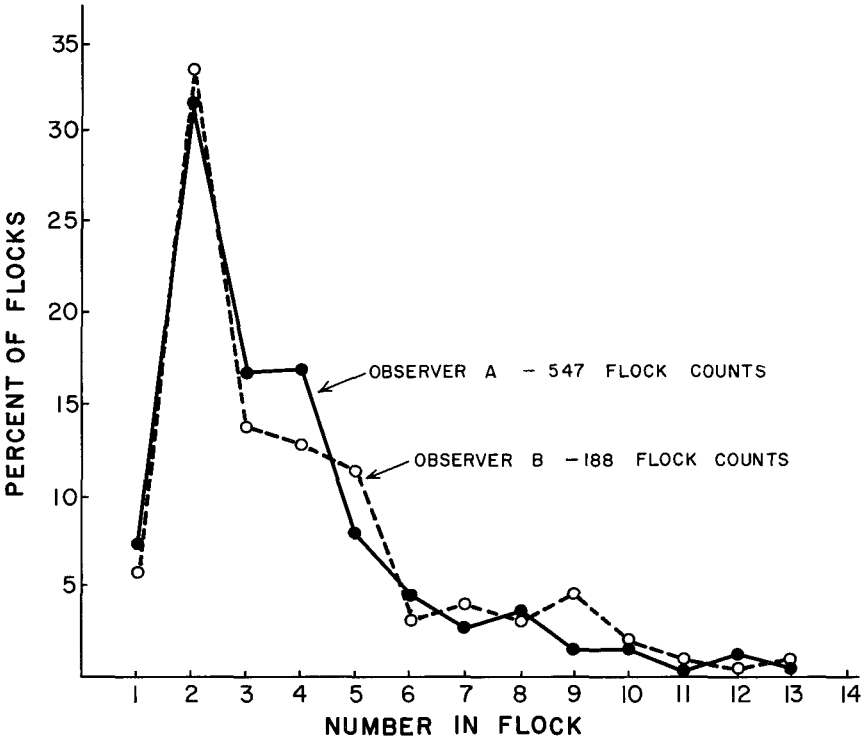

FIG. 1. Size of flocks of Whistling Swans in local movements, 4 April to 10 April 1962.

noon sampling periods. While McAtee (1924) was able to distinguish between dark-necked young birds and white-necked adults in fall swans, and Gabrielson and Lincoln (1959) state that young swans in their first winter are easily distinguished from their parents, we did not feel secure in making this distinction in the spring migrants observed at Ripon. Differences between young and adult members of a family group were often strikingly obvious as they walked through a stubble field, but varying light conditions and greater distances frequently made these distinctions uncertain. Perhaps we were too conservative in our attempts to separate young from old. It would have been very interesting to have compared age-ratio counts from this source with the findings from our flock-size counts.

The results of swan flock counts are presented in Fig. 1. Since the observers usually did not overlap in time of observation, differences in counts are not altogether the result of sampling error, i.e., the counts are not necessarily of the same groups of birds. The very close agreement obtained serves as a non-parametric test of the significance of differences in flock-size frequencies.

The peak in pairs which characterizes the frequency curve in Fig. 1 is similar to the frequency distribution of flock-size counts reported by Elder and Elder (op. cit.) among local movements of Canada Geese in fall. We are tempted to suggest that the higher proportion of pairs in our swan data would likely result from an increase in courtship flights in spring migrants; however, Delacour and Mayr (1945:8) state that pair formation in swans takes place in fall, without elaborate displays. We are, of course, not even certain of the sex or age of pairs in our tallies. A correct interpretation of the secondary peaks in three, four, and five size classes hinges on the time of dissolution of parental and sibling bonds. McAtee (op. cit.) describes family groups on Currituck Sound, N. C., in fall and says, "this grouping is well known to all baymen . . . comment on the success of the last breeding season is based on the size of these subdivisions of the flock." We can find no reference to family bonds in the Whistling Swan beyond the first winter and hence must turn to Banko's (1960) observations on the Trumpeter Swan (*Olor buccinator*). Banko makes no comment on the persistence of parental bonds beyond the first winter, but implies that sibling bonds may persist longer. He states (p. 121): "only two notes exist regarding the duration of family ties after the offspring's first winter." Both of these observations refer to the apparent persistence of bonds between brood mates beyond the first winter.

Returning to the identity of the secondary peaks in our Ripon data, if we assume that the parental bond is broken by the end of the first winter, it would follow that the peaks of three, four, and five bird groups would probably represent brood mates. This would be in reasonable agreement with Bent's (1925) statement of an average family size of six to seven in wintering swans on the Virginia and Carolina Bays. If, however, we assume that the parental bond persists beyond the first winter, the secondary peaks of three, four, and five could be considered to be family groups. This interpretation would more closely agree with the observations of Gabrielson and Lincoln (1959:112) in Alaska, who state: "most pairs will have from one to three cygnets at hatching time, . . . " In closing, it is interesting to note that McAtee (op. cit.) observed considerable variation in the size of family groups on Currituck Sound: ". . . the pairs of swans some years having from one to three cygnets each, and in others from three to five."

SUMMARY

A concentration of approximately 1,000 swans gathered on a vernal pool in east-central Wisconsin in early April 1962. Two observers obtained very close agreement with independent counts of the size of flocks and subflock groups departing and returning to the concentration area. Pairs were by far the most frequently encountered size group. The next most frequent groups were threes, fours, and fives, respectively.

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